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(56) Documents Cited

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US 4387633 A

US 3785281 A

US 3785280 A

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(54) Apparatus for removing liquid from solid waste

(57) A material treatment apparatus for removing liquid from solid waste i.e. screenings from a water treatment plant, is in the form of lorry 10 with a hopper 16 thereon for receiving the solid waste. The hopper discharges into a tube 20, part of which is perforated. A hydraulic ram 24 is selectively movable into the tube 20 to crush material therein such that liquid is discharged through the perforations in the tube 20. Following compaction the ram 24 urges compacted material into a container 38. The apparatus permits material to be collected from a number of sites, compressed and liquid removed such that the volume and also the weight is greatly reduced. In an alternative embodiment (not shown) the material treatment apparatus could be stationary rather than be situated on a vehicle.

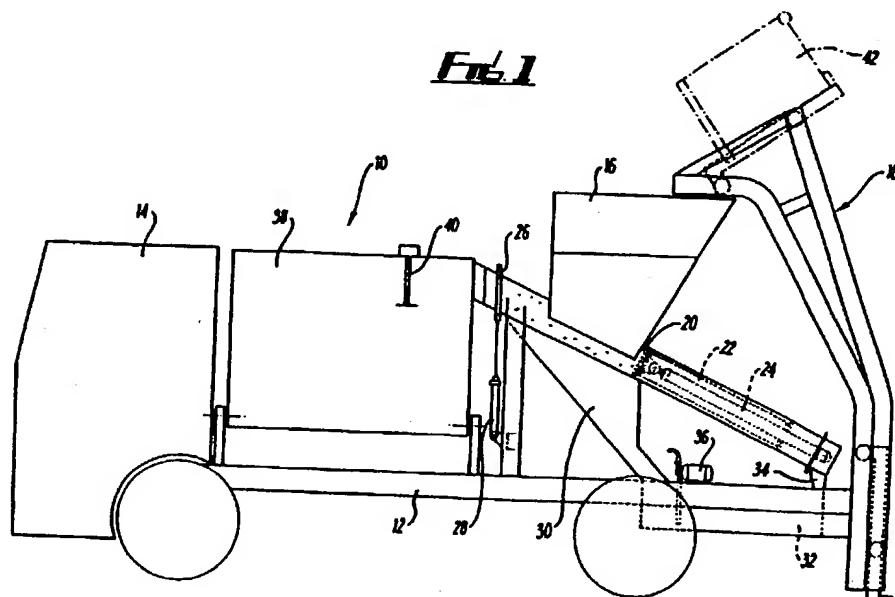
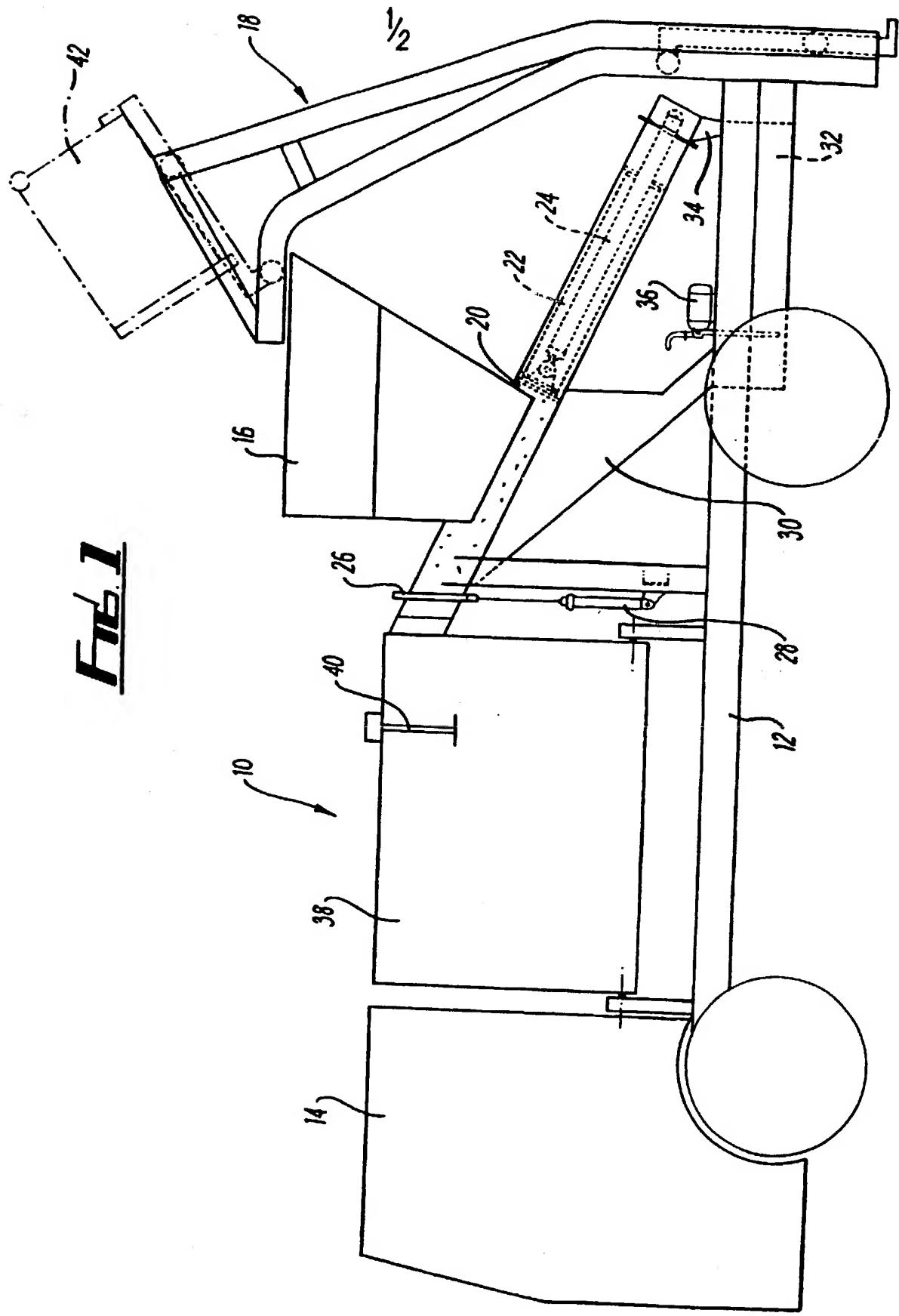


Fig. 1



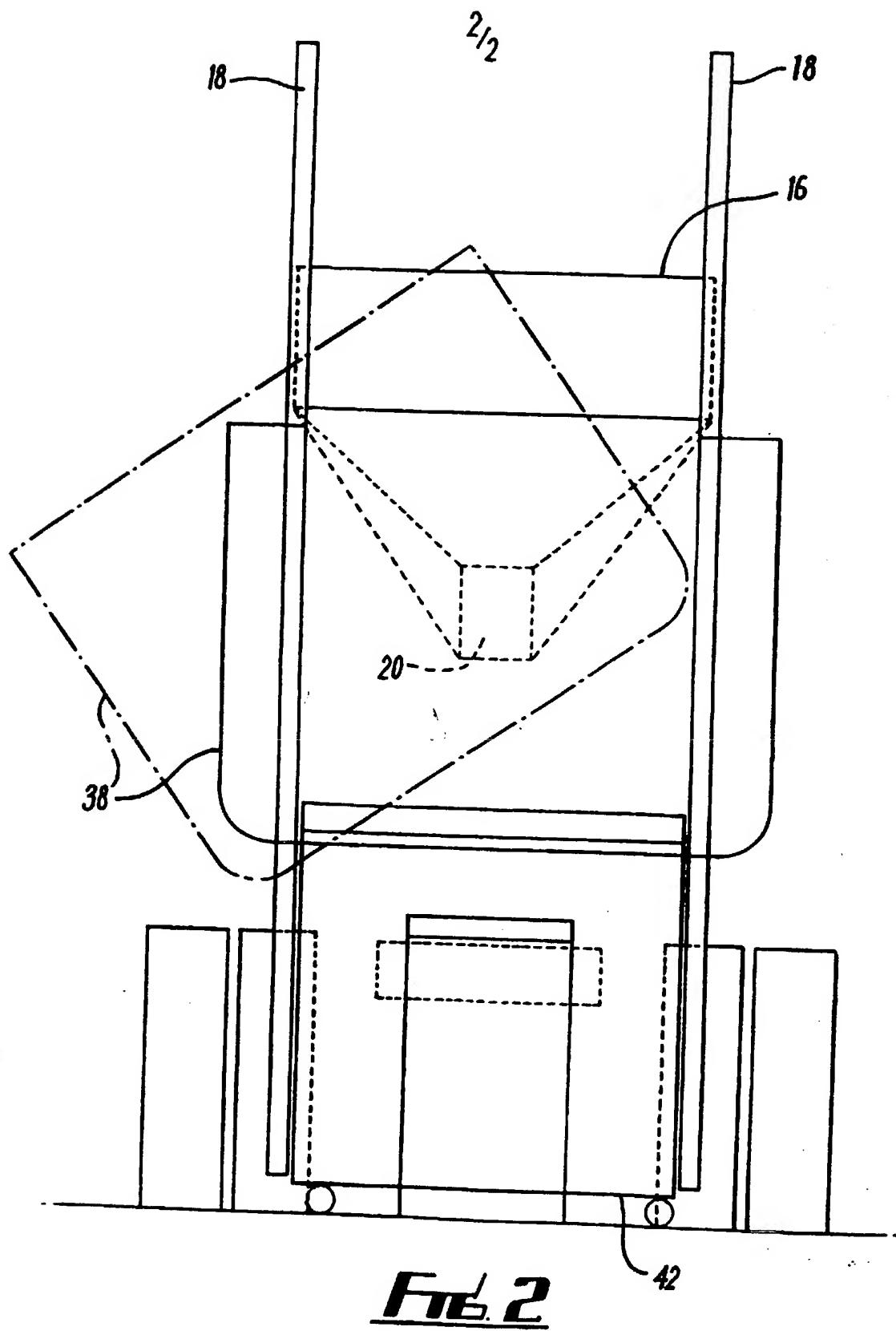


Fig. 2

MATERIAL TREATMENT APPARATUS

This invention concerns material treatment apparatus, and particularly but not exclusively apparatus for treating liquid containing solid waste, and more especially solid waste from water treatment plants.

At water treatment plants a certain amount of solid waste is obtained which cannot be oxidised during treatment of the water. This solid waste is traditionally referred to as "screenings". Generally this waste is transferred into skips and periodically the skips are emptied at a land fill site. Between emptyings this waste is generally open to atmosphere which is often undesirable. This waste tends to have a relatively high water content from the original treatment and/or from subsequent precipitation, which content increases the costs incurred in disposing of the waste as this is generally charged by weight, and transportation costs are obviously also increased.

According to the present invention there is provided material treatment apparatus, the apparatus comprising a receptacle for material, a confined space in communication with the receptacle, and means for compressing material located in the confined space whilst allowing liquid to leave said space.

Preferably the confined space is located immediately below the receptacle.

At least part of the confined space may be defined by porous walls, which walls may be perforated.

The apparatus may comprise a container into which the material is urged following compression. A selectively operable closure member may be provided between the confined space and container.

The apparatus may comprise a press member selectively movable into the confined space to compress material between the press and the closure member. The press member may be arranged to urge material into the container when the closure member is open. The press member is preferably

movable directly beneath the receptacle so as to be able to prevent communication between the receptacle and the confined space during pressing of material.

The confined space is preferably in the form of a tube and the press member preferably provides a sliding fit in the tube. The press member is preferably elongate such that at its fullest extension it extends fully across the lower end of the receptacle. Sealing means may be provided around the press member. The closure member preferably comprises a member selectively extendible across the tube. The tube preferably extends upwardly towards the container.

The apparatus preferably comprises means for collecting liquid urged from the material during compression, and storage means may be provided for the collected liquid. A discharge pump may be provided for the storage means. The perforated walls of the confined space are preferably substantially surrounded by means for collecting liquid passing therethrough, and the collecting means may comprise ducting leading to the storage means.

The apparatus preferably also comprises means for tipping containers so as to discharge material from the containers into the receptacle.

The container preferably comprises means for indicating when the container is full, and said means may be arranged to prevent further material being urged into the container when full.

The container may be pivotally mountable so as to permit emptying thereof by tipping. The container is preferably selectively disconnectable from the confined space to facilitate emptying of the container.

The apparatus may be arranged such that material is compressed a plurality of times, and the apparatus may be arranged such that material is compressed for any of: a predetermined number of times; a predetermined

period or periods of time; or until a predetermined resistance is detected by the press means.

The apparatus may be arranged to detect following an initial compression whether above a predetermined amount of material has been compressed, and if not for the press member to be retracted to permit further material to drop into the confined space from the receptacle for subsequent compression.

The apparatus is preferably automatically operable such that compressed material is automatically urged into the container following a required compression thereof.

The apparatus preferably comprises a vehicle upon which all the other components of the apparatus are mounted. The press member and/or enclosure member are preferably operable by power from the vehicle, and desirably comprise hydraulic rams.

An embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings, in which:-

Fig. 1 is a diagrammatic side view of material treatment apparatus according to the invention; and

Fig. 2 is a diagrammatic end view of the apparatus of Fig. 1.

The drawings show material treatment apparatus in the form of a lorry 10 suitable for collecting solid material from water treatment and purification plants. The lorry 10 has a flat body 12 behind the cab 14 on which the following components are mounted. A hopper 16 is mounted towards the rear of the body 12. A bin discharge assembly 18 is located behind and extending above the hopper 16. The assembly 18 is of a conventional form and comprises tracks for projections or wheels on lower and upper parts of wheeled bins to

run along such that the bins are tipped up above the hopper 16, as shown in Fig. 1, to discharge material thereinto.

The hopper 16 discharges into a circular section tube which extends upwardly from adjacent the rear of the body 12 for a little over half the length thereof. Located in the tube 20 is a hollow piston 22 which slidingly fits in the tube 20. A hydraulic ram 24 is provided within the piston 22 extending from the lower end of the tube 20. The ram 24 is arranged such that the piston 22 can be located fully below the outlet of the hopper 16, and when the ram is fully extended the piston extends substantially to the upper end of the tube 20. The piston 22 is of sufficient length to fully close the bottom of the hopper 16 when fully extended.

A selective closure member is provided in the form of a plate 26 with a top edge which slopes downwardly on each side from a central apex. The plate 26 is connected to a further ram 28 provided towards the upper end of the tube 20 to permit the tube 20 to be selectively closed. The plate 26 is movable through a slot in a lower side of the tube 20 to extend into a slot in the upper side such that any trapped debris can be expelled through the upper slot. The portion of tube 20 between just below the plate 26 and the lowermost part of the opening of the hopper 16 is perforated. Ducting 30 is provided around the perforated part of the tube 20. The ducting 30 leads into a storage tank 32 towards the rear of the body 12. Ducting 34 also extends from the lowermost end of the tube 20 into the tank 32. A discharge pump 36 is provided for the tank 32. A seal is provided around the piston 22 and this seal may take any appropriate form such as an O-ring or cup seal. If any liquid passes beyond this seal it will eventually pass through the ducting 34 and into the tank 32.

The upper end of the tube 20 extends into the top of a rectangular section container 38. The container 38 is pivotally mounted on the body 12 as shown in Fig. 2 to permit tipping of material therefrom. A level monitor 40 is provided on the container 38 to provide an indication of when the container 38 is full, and the monitor 40 may be connected to the ram 28 to prevent the plate

26 from being moved to open the tube 20 when it has been detected that the container 38 is full.

In use, solid waste such as screenings from a water treatment plant is fed into conventional wheeled containers 42. When the lorry 10 arrives at the treatment plant, the or each container 42 is sequentially tipped using the assembly 18 such that the material therein passes into the hopper 16. Material from the hopper 16 passes into the tube 20 therebeneath. The ram 24 is then actuated causing the piston 22 to compress the material in the tube 20 against the plate 26 which is in a closed position. Liquid in the material is urged therefrom and out through the perforations into the tube 20 through the ducting 30 and into the tank 32. The material in the tube 20 will almost certainly be compressed a number of times against the plate 26. The apparatus can be arranged such that each load of material in the tube 20 is compressed a set number of times. Alternatively, the material can be compressed for a set period of time or until a set resistance is detected by the ram 24.

The apparatus will generally be arranged to detect whether following compression there is above a predetermined required amount of compressed material in the tube 20. If not, the piston 22 will automatically be retracted to permit further additional material to drop into the tube 20 for subsequent compression. The apparatus is also arranged such that automatic operation can be overridden to for instance clear any residual material from the tube 20 at the end of an operation or shift.

Once the compression of the material is complete, the piston 22 will be retracted slightly and the plate 26 opened by the ram 28. The piston 22 is then extended fully to urge the compressed material into the container 38. This process will be repeated until the hopper 16 is empty and all the material therefrom has been compressed and urged into the container 38. The lorry 10 is arranged such that once the container or containers 42 have all been emptied, the compression of the material and subsequent urging into the container 38 will continue automatically such that the lorry 10 can be driven to a further

water treatment plant as the compression continues. At this further plant, fluid collected in the tank 32 can be discharged directly into the plant for treatment whilst compression of further material can continue. A non-return valve is fitted in the system between the tank 32 and the ram 24. Once all the solid material has been collected or when the container 38 is full, as may be detected by the level monitor 40, the lorry 10 can be driven to a land fill site and emptied by tipping the container 38 as shown in Fig. 2.

There is thus described material treatment apparatus which provides for a number of advantages. The described apparatus permits material to be collected from a number of sites compressed and liquid removed, such that the volume of material and also weight is greatly reduced, thereby providing considerable savings in cost in transporting the material and in paying to tip the material. The compression and removal of liquid can continue whilst the vehicle is being driven thereby allowing a rapid pick-up of material from a number of locations. The liquid collected from the waste can readily be transferred back into a water treatment plant. This apparatus is particularly suited for use where there are a number of small water treatment plants as may be found in rural areas.

Various modifications may be made without departing from the scope of the invention. For example, the lorry may be configured in many different ways. For instance, the hopper may be differently located and/or shaped and the inclination and positioning of the tube could be different. The container can take many different forms and could discharge in a different way.

It is to be realised that the invention is usable in a wide range of applications other than that described above. The arrangement for removing liquid from material need not necessarily be restricted to treatment of waste material and the apparatus could be stationary rather than situated on a vehicle. Material could be constantly discharged into the apparatus rather than discharged from discrete containers.

Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed thereon.

**Claims:**

1. Material treatment apparatus, the apparatus comprising a receptacle for material, a confined space in communication with the receptacle, and means for compressing material located in the confined space whilst allowing liquid to leave said space.
2. Apparatus according to claim 1, in which the confined space is located immediately below the receptacle.
3. Apparatus according to claims 1 or 2, in which at least part of the confined space is defined by porous walls.
4. Apparatus according to claim 3. In which the walls of the confined space are perforated.
5. Apparatus according to any of the preceding claims, in which the apparatus comprises a container into which the material is urged following compression.
6. Apparatus according to claim 5, in which a selectively operable closure member is provided between the confined space and container.
7. Apparatus according to claim 6, in which the apparatus comprises a press member selectively movable into the confined space to compress material between the press and the closure member.
8. Apparatus according to claim 7, in which the press member is arranged to urge material into the container when the closure member is open.
9. Apparatus according to claims 7 or 8, in which the press member is movable directly between the receptacle so as to be able to prevent

**communication between the receptacle and the confined space during pressing of material.**

10. **Apparatus according to any of claims 7 to 9, in which the confined space is in the form of a tube and the press member preferably provides a sliding fit in the tube.**
11. **Apparatus according to claim 10, in which sealing means are provided around the press member.**
12. **Apparatus according to claims 10 or 11, in which the closure member comprises a member selectively extendible across the tube.**
13. **Apparatus according to any of claims 10 to 12, in which the tube extends upwardly towards the container.**
14. **Apparatus according to any of claims 7 to 13, in which the press member is elongate such that at its fullest extension it extends fully across the lower end of the receptacle.**
15. **Apparatus according to any of claims 5 to 14, in which the container comprises means for indicating when the container is full.**
16. **Apparatus according to claim 15, in which the full indicating means is arranged to prevent further material being urged into the container when full.**
17. **Apparatus according to any of claims 5 to 16, in which the container is pivotally mountable so as to permit emptying thereof by tipping.**
18. **Apparatus according to any of claims 5 to 17, in which the container is selectively disconnectable from the confined space to facilitate emptying of the container.**

19. Apparatus according to any of the preceding claims, in which the apparatus is arranged such that material is compressed a plurality of times.
20. Apparatus according to claim 19, in which the apparatus is arranged such that material is compressed for any of: a predetermined number of times; a predetermined period or periods of time; or until a predetermined resistance is detected by the press means.
21. Apparatus according to claims 19 or 20 when dependent on at least claim 7, in which the apparatus is arranged to detect following an initial compression, whether above a predetermined amount of material has been compressed, and if not for the press member to be retracted to permit further material to drop into the confined space from the receptacle for subsequent compression.
22. Apparatus according to any of claims 19 to 21 when dependent on at least claim 5, in which the apparatus is automatically operable such that compressed material is automatically urged into the container following a required compression thereof.
23. Apparatus according to any of the preceding claims, in which the apparatus comprises means for collecting liquid urged from the material during compression.
24. Apparatus according to claim 23, in which the confined space is substantially surrounded by means for collecting liquid passing therethrough, and the collecting means comprises ducting leading to the storage means.
25. Apparatus according to claim 24, in which the collecting means comprises ducting leading to the storage means.
26. Apparatus according to any of claims 23 to 25, in which storage means is provided for the collected liquid.

27. Apparatus according to claim 26, in which a discharge pump is provided for the storage means.
28. Apparatus according to any of the preceding claims, in which the apparatus comprises means for tipping containers so as to discharge material from the containers into the receptacle.
29. Apparatus according to any of the preceding claims, in which the apparatus comprises a vehicle upon which all the other components of the apparatus are mounted.
30. Apparatus according to claim 29, in which the press member and/or enclosure member are operable by power from the vehicle.
31. Apparatus according to claims 29 or 30, in which the press member and/or enclosure member comprise hydraulic rams.
32. Material treatment apparatus substantially as hereinbefore described with reference to the accompanying drawings.
33. Any novel subject matter or combination including novel subject matter disclosed, whether or not within the scope of or relating to the same invention as any of the preceding claims.



Application No: GB 9611803.9  
Claims searched: 1-33

Examiner: Kalim Yasseen  
Date of search: 25 March 1997

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): B1D (DGBX, DJAX, DLAX)

Int Cl (Ed.6): B30B 9/06

**Other:**

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	WO 94/09978 A1 (ROTO SIEVE) see whole document	1- 8, 10-14, 17, 18, 23-28
X	US 5 160 612 (SKOCIC) see whole document	at least 1, 29-31
X	US 4 622 903 (WILLIAM) see whole document especially column 1 line 59 to column 2 line 19 & column 3 line 40 to column 4, figure 2	1-28
X	US 4 421 022 (BURGIN) see whole document	at least 1
X	US 4 387 633 (BALLANTYNE) see whole document	at least 1
X	US 3 785 281 (LIGH) see whole document especially column 2 line 65 to column 4 line 43 & column 5 lines 63-59	at least 1-12
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